REMARKS

Claims 13 and 33 have been canceled. Thus, claims 1, 2, 12, 14-17, 19, 21-24, 29 and 30-32 are pending. Applicant presents arguments for overcoming the rejections based on the prior art of record. Accordingly, Applicant respectfully submits that the present application is in condition for allowance.

I. Claim Rejections – 35 USC §112, first paragraph

> *In the non-final Office Action dated October 16, 2009, claims 31-33 are rejected under 35 USC §112, first paragraph, as failing to comply with the written description requirement.*

Claim 33 has been canceled, and the limitation in claims 31 and 32 requiring a "non-oriented crystal structure" has been deleted. Accordingly, Applicant respectfully requests reconsideration and removal of this rejection.

II. Claim Rejections – 35 USC §112, second paragraph

> *In the non-final Office Action dated October 16, 2009, claims 31-33 are rejected under 35 USC §112, first paragraph, as being indefinite.*

Claim 33 has been canceled, and the limitation in claims 31 and 32 requiring a "non-oriented crystal structure" has been deleted. Accordingly, Applicant respectfully requests reconsideration and removal of this rejection.

III. Claim Rejections – 35 USC §103(a)

A. In the non-final Office Action dated October 16, 2009, claims 1, 2, 12-17, 19, 21-24, 29 and 30 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 5,964,966 issued to Goyal et al.

Independent claims 1 and 2 of the present application require a sputtering target consisting of a specific nickel-tantalum alloy that is also required to be of very high purity. For example, the content of "inevitable impurities" in the target is 100wtppm or less (excluding gas components) and the gas components include an oxygen content of 50wtppm or less and nitrogen, hydrogen and carbon contents each of 10wtppm or less. Dependent claims 12, 14, 19 and 21 further limit the impurities (excluding gas components) to 10wtppm or less and oxygen gas component content to 10wtppm or less.

It has been repeatedly and readily acknowledged in the Office Action that "Goyal et al. are silent as to the impurity contents of the nickel-based alloys taught therein."

In the Office Action, the following is stated with respect to the purity limitations stated in the claims:

> "Purer forms of known products may be patentable, by the mere purity of a product, by itself, does not render the product unobvious. … Factors to be considered in determining whether a purified form of an old product is obvious over the prior art include **whether the claimed chemical compound or composition has the same utility** as closely related materials in the prior art, and whether the prior art suggests the particular form or structure of the claimed material or suitable methods of obtaining that form or structure."

In the Office Action, it is stated that "it has been established that it would be obvious to form a sputtering target from the substrate material of Goyal et al., thus satisfying that the material may have the same utility as that defined in the claim." Applicant respectfully requests reconsideration with respect to this issue for reasons stated below. Applicant respectfully submits that the substrate material disclosed in Goyal et al. does not have the same utility as the

sputtering target required by the claims of the present application. Removal of the rejection is therefore requested.

As best stated in column 3, lines 8-21, of Goyal et al., a certain level of purity of Cu, Ni or Al is required to obtain a desired "sharp cube texture". Examples of the level of purity concentrations required are recited, as follows: "0.0025% P, 0.3% Sb, 0.18% Cd, 0.47% As, 1% Sn, 0.5% Be". Of course, this converts to units of ppm as follows: 25ppm P, 3,000ppm Sb, 1,800ppm Cd, 4,700ppm As, 10,000ppm Sn, and 5,000 Be.

While a nickel tantalum substrate having the above level of purity may have utility according to the teachings of Goyal et al., it could not be used as a sputtering target for forming a gate electrode of a semiconductor device, which is the core of a semiconductor device. This is because, with the above referenced level of purity, the nickel tantalum alloy would not be able to provide the intended electrical properties of a gate electrode thin film of a semiconductor device. This is common technical knowledge among engineers engaged in the semiconductor industry. Accordingly, the relative term "high purity" used with respect to the substrate in Goyal et al. has a considerably different meaning from the purity of 4N or higher that is required by the claims of the present invention and cannot be considered to provide the same utility as that specified in the claims of the present application.

By way of example, a material having 4N (99.99wt%) purity includes 0.01wt% impurities (excluding gas components). This converts to 100wtppm of total impurities, excluding gas components. As stated above, Goyal et al. merely require levels of 25ppm P, 3,000ppm Sb, 1,800ppm Cd, 4,700ppm As, 10,000ppm Sn, and 5,000 Be which is not close to the level of purity required by a gate electrode.

The present invention is based on the discovery that, by adding Ta as a specific metal element to Ni metal, the nickel silicide that is formed from the Ta-containing Ni alloy sputtering target is able to prevent a phase transition from NiSi to $NiSi_2$. Needless to say, the intended result cannot be obtained if elements other than Ta exist in the alloy. Thus, the present invention requires the inevitable impurities (excluding gas components) to be 100wtppm or less, or 10wtppm or less.

Comparative Examples 1-1 and 2-1 described in the present application, as filed, (having 3N5 purities) have problems with respect to producing an unacceptable amount of particles and with respect to not being able to provide a required level of magnetic permeability. See page 13, lines 1-3 and 10-14, of the present application, as filed. Thus, if impurity content exceeds the levels recited in the claims of the present application, sufficient results cannot be obtained. Thus, the material disclosed by Goyal et al. does not and cannot provide the "same utility" as that required of the sputtering target of the claims of the present application.

In addition, it can also be stated that the present invention provides an unexpected result relative to the Goyal et al. disclosure. For example, by providing a Ni-Ta alloy of required composition and required purity, a sputtering target for use in forming thin film gate electrodes for semiconductor devices can be provided. This is neither taught nor expected from the Goyal et al. disclosure. Goyal et al. merely teach lowering levels of impurities to an extent needed to enable the formation of a cube texture. Further, reducing impurities is of no effect according to the teachings of the Goyal et al. patent.

Further, the present invention requires that the impurity concentration of gas components of oxygen, nitrogen, hydrogen, carbon and the like also be extremely low. For instance, claims 1 and 2 of the present application require oxygen content to be 50wtppm or less and nitrogen,

hydrogen and carbon contents to be 10wtppm or less each. Dependent claims 14 and 21 require oxygen content to be 10wtppm or less. Gas components are conventionally ignored, as in the Goyal et al. patent. However, according to the present invention, it is critical to reduce these gas components to the stated levels because these gas components react with Si and Ni and respectively become oxides, nitrides, hydroxides, and/or carbides and cause the characteristics of the obtained nickel silicide film to deteriorate considerably.

Accordingly, both conditions of "adding a prescribed amount of Ta" to the nickel sputtering target and "achieving a purity level of 4N or higher and reducing impurity elements" must be satisfied to achieve favorable characteristics with respect to thermal stability and the like required of a nickel silicide film. If either of the foregoing conditions is not satisfied, the utility and object of the present invention can no longer be achieved.

Accordingly, Applicant respectfully submits that the patentability of the claims of the present application cannot be denied based on Goyal et al. which admittedly lacks a disclosure of the conditions of achieving a purity level of 4N or higher and reducing impurity elements. Since Goyal et al. fail to disclose this critical limitation, its disclosed material does not provide the "same utility" and the present invention clearly provides results which are "unexpected" in view of the Goyal et al. disclosure.

Applicant respectfully requests reconsideration and removal of the rejection based on the Goyal et al. patent.

B. In the non-final Office Action dated October 16, 2009, claims 1, 2, 12-17, 19, 21-24 and 29-33 are rejected under 35 USC §103(a) as being obvious over WO 01/94660 A2 of Segal et al.

As discussed above, independent claims 1 and 2 of the present application require a sputtering target consisting of a specific nickel-tantalum alloy that is also required to be of very high purity. For example, the content of "inevitable impurities" in the target is 100wtppm or less (i.e., a purity of 4N (99.99wt%) or more) (excluding gas components) and the gas components include an oxygen content of 50wtppm or less and nitrogen, hydrogen and carbon contents each of 10wtppm or less. Dependent claims 12, 14, 19 and 21 further limit the impurities (excluding gas components) to 10wtppm or less (i.e., a purity of 5N (99.999wt%) or more) and oxygen gas component content to 10wtppm or less.

It is readily acknowledged in the Office Action that "Segal et al. are silent as to the impurity contents of the nickel-based alloys taught therein."

In the Office Action, the following is stated with respect to the purity limitations stated in the claims:

> "Purer forms of known products may be patentable, by the mere purity of a product, by itself, does not render the product unobvious. ... Factors to be considered in determining whether a purified form of an old product is obvious over the prior art include **whether the claimed chemical compound or composition has the same utility** as closely related materials in the prior art, and whether the prior art suggests the particular form or structure of the claimed material or suitable methods of obtaining that form or structure."

In the Office Action, it is stated that "it is already known to those of ordinary skill in the art that increased purity of target bodies is desirable and beneficial" and the "the purity limitations in the claim fail to patentably distinguish the claimed invention from the prior art". Applicant respectfully requests reconsideration with respect to this issue for reasons stated below. Applicant respectfully submits that the Segal et al. sputtering target does not have the

same utility as the sputtering target required by the claims of the present application and an unexpected result is provided by the present invention. Removal of the rejection is therefore requested.

Applicant respectfully submits that the sputtering target of Segal et al. could not be used as a sputtering target for forming a gate electrode of a semiconductor device, which is the core of a semiconductor device. This is because, without the level of purity claimed by the claims of the present application, a nickel tantalum alloy made in accordance with Segal et al. would not be able to provide the intended electrical properties of a gate electrode thin film of a semiconductor device. A purity as may be used with respect to Segal et al. is considerably different from the purity of 4N or higher that is required by the claims of the present invention. The target of Segal et al. cannot be considered to provide the same utility as that specified in the claims of the present application. By way of example, a material having 4N (99.99wt%) purity includes 0.01wt% impurities (excluding gas components). This converts to 100wtppm of total impurities, excluding gas components.

The present invention is based on the discovery that, by adding Ta as a specific metal element to Ni metal, the nickel silicide that is formed from the Ta-containing Ni alloy sputtering target is able to prevent a phase transition from NiSi to $NiSi_2$. Needless to say, the intended result cannot be obtained if elements other than Ta exist in the alloy. Thus, the present invention requires the inevitable impurities (excluding gas components) to be 100wtppm or less, or 10wtppm or less.

Comparative Examples 1-1 and 2-1 described in the present application, as filed, (having 3N5 (99.95wt%) purity, which is still of a relative "high" purity) have problems with respect to producing an unacceptable amount of particles and with respect to not being able to provide a

required level of magnetic permeability. See page 13, lines 1-3 and 10-14, of the present application, as filed. Thus, if impurity content exceeds the levels recited in the claims of the present application, sufficient results cannot be obtained. Thus, the material disclosed by Segal et al. does not provide the "same utility" as that required of the sputtering target of the claims of the present application.

In addition, it can also be stated that the present invention provides an unexpected result relative to the Segal et al. disclosure. For example, by providing a Ni-Ta alloy of required composition and required purity, a sputtering target for use in forming thin film gate electrodes for semiconductor devices can be provided. This is neither taught nor expected from the Segal et al. disclosure.

Further, the present invention requires that the impurity concentration of gas components of oxygen, nitrogen, hydrogen, carbon and the like also be extremely low. For instance, claims 1 and 2 require oxygen content to be 50wtppm or less and nitrogen, hydrogen and carbon contents each to be 10wtppm or less. Dependent claims 14 and 21 require oxygen content to be 10wtppm or less. It is critical to reduce these gas components to the stated levels because these gas components react with Si and Ni and respectively become oxides, nitrides, hydroxides, and/or carbides and cause the characteristics of the obtained nickel silicide film to deteriorate considerably. Segal et al. provide no such disclosure.

Accordingly, both conditions of "adding a prescribed amount of Ta" to the nickel and "achieving a purity level of 4N or higher" must be satisfied to achieve favorable characteristics with respect to thermal stability and the like required of a nickel silicide film. If either of the foregoing conditions is not satisfied, the utility and object of the present invention can no longer be achieved. Accordingly, Applicant respectfully submits that the patentability of the claims of

the present application cannot be denied based on the disclosure of Segal et al. which admittedly lacks a disclosure of the conditions of achieving a purity level of 4N or higher. Since Segal et al. fail to disclose this critical limitation, its disclosed material does not provide the "same utility" and the present invention clearly provides results which are "unexpected" in view of the Segal et al. disclosure.

Applicant respectfully requests reconsideration and removal of the rejection based on the Segal et al. publication.

Conclusion

In view of the above amendments and remarks, Applicant respectfully submits that the rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

Respectfully submitted,
Howson & Howson LLP
Attorneys for Applicants

By /William Bak/
William Bak
Reg. No. 37,277
501 Office Center Drive
Suite 210
Fort Washington, PA 19034
(215) 540-9216